Title: Exploring Place and Space: An Out of this World Unit on Place Value

Brief Overview:

Students are expected to read, write, represent, and compare numbers up to 10,000 in third grade and up to 1,000,000 in fourth and fifth grade. In this unit, students will explore place value concepts with the help of some facts and figures from the Solar System. Pairing astronomy with math, this unit will engage students in identifying the values of digits and also comparing the large numbers associated with the Solar System.

NCTM Content Standard/National Science Education Standard:

Numbers and Operations

- Understand the place-value structure of the base-ten number system and be able to represent and compare whole numbers and decimals

Grade/Level:

Grades 3-5

Duration/Length:

Three 60 minute lessons

Student Outcomes:

Students will:

- Read, write, and represent whole numbers using symbols, words, and models.
- Identify the place value of a digit in a number
- Compare, order, and describe whole numbers

Materials and Resources:

Day 1

- Student Resource 1 *(A Place in Space)*
- Student Resource 2 *(Make a Number)*
- Student Resource 3 *(Roll a Number)*
- Student Resource 4 *(Orbit Slip)*
- Teacher Resource 1
- Teacher Resource 2
- Teacher Resource 3

- Teacher Resource 4
- Teacher Resource 4A *(Orbit Slip—Answer Key)*
- Base ten blocks
- Student white boards
- White board markers
- Bulletin board paper
- 11” x 17” construction paper
- Glue and/or stapler
- Index Cards (various colors)
- Number Cube

Day 2

- Paper models of the sun and planets
- Sentence strips
- Student Resource 5 *(Compare the Planets Worksheet)*
- Student Resource 6 *(Place Value Comparison Chart)*
- Student Resource 7 *(Greater Than, Less Than, Equal To)*
- Student Resource 8 *(Orbit Slip)*
- Teacher Resource 5 *(Distances for Sentence Strips)*
- Teacher Resources 6 and 6a *(Compare the Planets game cards)*
- Teacher Resource 7 *(Compare the Planets Worksheet-Answer Key)*
- Teacher Resource 8 *(Place Value Comparison Chart- Answer Key)*
- Teacher Resource 9 *(Greater Than, Less Than, Equal To-Answer Key)*
- Teacher Resource 10 *(Orbit Slip-Answer Key)*

Day 3

- Place Value foldable *(from Day 1)*
- Number Cube
- Student Resource 9 *(Between the Earth and the Sun)*
- Student Resource 10 *(Space Value Summative Assessment)*
- Teacher Resource 11 *(Data for Ordering Numbers)*
- Teacher Resource 12 *(Orbital Ordering)*
- Teacher Resource 12A *(Between the Earth and the Sun-Answer Key)*
- Teacher Resource 13 *(Space Value Summative Assessment-Answer Key)*
- Teacher Resource 14 *(Kid-Friendly BCR rubric)*

Development/Procedures:

Day 1

- Pre-assessment
  Ask students what they know about place value. Distribute Student Resource 1 *(A Place in Space).* Students will complete Student Resource 1 as you rotate around the classroom.

Collect Student Resource 1 and grade. Answers for Student Resource 1 are located on Teacher Resource 1.

- Engagement

  Distribute base-ten blocks to student groups. Each group should get three thousands blocks, five hundreds blocks, 8 tens blocks, and 10 ones blocks. Tell students that scientists have ways of measuring things in space, whether they actually travel to the planets or use satellites. They have to not only measure the angular size, but also take into account the distance of the object being measured. One measurement that scientists have determined is the equatorial diameter of the planet Mercury, which is 3,031 miles.

  Direct students to work in their groups to represent the number 3,031 using the place value blocks (allow 1-2 minutes for students to work together). Ask one volunteer from one group to come to the front of the room to demonstrate how they represented the number.

  Tell students to pile their place value blocks in the center of their tables, so they will have access to them throughout the lesson, if needed.

- Exploration

  Tell students to take out their white boards and a white board marker to play a game called *"What's My Number?"* Explain that they will be given clues about a number and they must listen carefully to build the number. Clues are found on Teacher Resource 2.
  Tell students that their number, 7,519 is the equatorial diameter of Venus, in miles. Tell the students to think back to the engagement activity with base ten blocks and the pre-assessment, in which they learned the equatorial diameters of Mercury and Jupiter, and how those numbers compare to one another.

- Explanation

  Tell students that many of the numbers relating to space are much larger than what they have already seen in this lesson. For example, the distances of the planets from the sun have place values in the millions and greater. Direct students to the front board where a large piece of bulletin board paper has been placed to create a class place value chart. The class will then label the place value chart up to the millions.
  - Call students to the front to label the place values.
  - Pose questions such as: If I put a 5 in the hundreds place, what value will it have?

  Distribute construction paper to students so they can make a foldable place value chart. Directions for making a foldable are found on Teacher Resource 3.

Distribute index cards and markers and instruct students to write the digits 0-9 on the index cards. When instructed, they will place these cards in their foldable to represent the digits.
Use clues found on Teacher Resource 4A-B to allow students to create numbers in the millions.

- Keep the place value chart on the board to act as a visual for the students.
- After each clue is read, a student will come up and put a number card in the proper place value pocket on your foldable.

Instruct students to work in their teams to create numbers in the millions using their number cards. As students work, circulate and assist when necessary.

- Application

  Students will need to keep their digit cards out for this activity. Students will work in pairs to complete Student Resource 2 (Make A Number - answers will vary). Circulate throughout the room and prompt students with questions such as: Do you always create the same number as your partner? and How do you know where to place the digits?

- Differentiation
  - Reteach

    Students who have demonstrated difficulty with the place value concepts may work with a small group help. Index cards will be provided for the students, in varying colors and each color will represent different place value periods, i.e. Millions period –pink cards; Thousands Period—blue cards; Ones Period—green cards. Students will work with you to create numbers up to the millions, each period being separated by a different color, so as to distinguish what the student should say when they read the number.

  - Enrich

    Students who demonstrate proficiency with the place value concepts will work in partners to play a game called Roll a Number! (Student Resource 3)

- Assessment

  Students will complete an Orbit Slip (Student Resource 4) to assess understanding of place value concepts. Remind students that they must complete the Orbit Slip to stay in "orbit" for the next day's lesson. Orbit Slip will help determine differentiated groups in Day 2 of the Unit.

Day 2

- Engagement
  Pose this question to students: Did you know that the temperature of the core of the sun is 27,000,000 degrees? Have students help build this number on the class place value chart. Continue, by asking:What is the value of the 2 in that number? The value of the 7?

  Ask students what would happen if 30,000 were added to the temperature? Ask a volunteer to come up and show the change in the number. Continue posing conditional situations about the change in place value/temperature.

- Exploration
  Place paper models of the sun and planets on the front board; the planets must be placed according to their distances from the sun. Give students sentence strips with the distances of the planets from the sun written on them (Distances are found on Teacher Resource 5). Instruct students to work together as a class to match the sentence strips with the planets on the board. Allow students to make corrections to the sentence strips as necessary.

  Discuss with students the reasons they placed the sentence strips with the particular planets. Ask questions such as: How did you know to put that sentence strip with Mercury? Student answers should be, “Because it has less place value spaces.” or “The number in the millions place is smaller than the other numbers.”

  Sun and planet models will remain on the board as a reference.

- Explanation

- Pick two distances to compare. Tell students you want to find out which planet is the greatest distance, or farthest from the sun
  - i.e. Mercury (36,000,000 miles) or Jupiter (483,400,000 miles)
  -
- Model strategies students can use to compare the two distances.
  - Start by counting the number of place value spaces; the number with the most is larger.
    - In this case Jupiter’s distance is greater than Mercury’s, so it is farther away from the sun.
  - Tell the students that if the number of place value spaces is the same, start with the largest place value and compare those two numbers.
  - If the largest place values are equal to each other, compare the next greatest place value until one number is greater than the other.

    Give students the following example to compare: The diameter of Venus is 7,519 miles, while the diameter of Earth is 7,926 miles. Which planet

has the largest diameter? (Earth) Work together as a class to compare the two place values. Think aloud with the students:

- First, you see that they each have the same number of place value spaces.
- Next, you compare the largest place value space which is the thousands place. In both numbers, it is the same.
- Move to the hundreds place and compare. The 5 in Venus's hundreds place is less than the 9 in Earth's, so this makes Earth's diameter greater.

Give the students the next 3 examples to compare at their tables. Circulate and assist where necessary and make sure students are using the vocabulary *greater than*, *less than*, *equal to*, and *place value*

- Example 1: Which is greater: 1,786,443 or 1,786,321?
- Example 2: Which is greater: 98,765 or 9,765?
- Example 3: Which is greater: 709,271 or 790,271?

- Application

  Instruct students to work in partners to play **Compare the Planets.** Cut out Teacher Resource 6 before playing the game as these are the students' game cards. Only use Uranus and Neptune for enrichment/extension.

  Tell students to complete the **Compare the Planets** worksheet after they have finished playing (Student Resource 5; Answer sheet is Teacher Resource 7). Circulate and assist where necessary and make sure students are using the correct vocabulary terms *greater than*, *less than*, *equal to*, and *place value*.

- Differentiation
  - Reteach

    Students having difficulty comparing place values will work in a small group with you. Provide students with a place value comparison chart (Student Resource 6.)

    Give students two numbers, i.e. 7,654 and 7,643. Instruct students to write these numbers in their place value comparison charts. Work with student and go through each place value space and determine whether that space in each number is greater than, less than, or equal to each other. Once a number is determined to be greater than or less than another, the number can be properly compared.

    Repeat the comparison process as necessary for student achievement. An example of how this is used can be found on Teacher Resource 8.

  - Enrich

Students displaying proficiency comparing place values will work with partners to complete Greater Than, Less Than, Equal To (Student Resource 7). Possible answers for this activity can be found on Teacher Resource 9.

- Assessment
  Instruct students to complete an Orbit Slip (Student Resource 8) to assess understanding of comparing place values. Remind students that they must complete the Orbit Slip to stay in "orbit" for the next day's lesson. Orbit Slip will help determine differentiated groups in Day 3 of the Unit. Answers can be found on Teacher Resource 10.

Day 3

- Engagement

- Give students this fact: The rings around Saturn are nearly 170,000 miles across.
- Ask students if they can think of a number to put in the hundred thousands place that would make a number greater than 170,000 and a number to put in the hundred thousands that would make a number less than 170,000.
- Ask: What if you added 25,000 to that number? How would it change?

- Exploration
  Tell students that there are three NASA rockets racing into space. Share the data found in the Exploration Section on Teacher Resource 11. Prompt students to work in their groups to order the speed of the rockets from fastest to slowest. Students should use the skills taught the day before to compare numbers.

  Students must discuss and show how they ordered the speed of the rockets. Prompt students to use vocabulary such as *greater than*, *less than*, *equal to*, and *place value*.

- Explanation
  Tell the students that we can use the same strategies they just shared in the exploration with even larger numbers. Give students the distances of four planets in the Solar System from the Sun. Distances will be written on sentence strips and will be placed on the front board.

  Ask students: What strategies can we use to order these numbers from least to greatest? Students should remember to compare the number of place value spaces, as well as comparing individual place value spaces to each other.

  Model the ordering process for the students. Data is found in the Explanation Section (Teacher Modeled) on Teacher Resource 11. Look at

the number of place value spaces. Three of the distances have the same number, but one distance has 3 more place value spaces.

- Ask the students: Would that number with the most place value spaces be the least or the greatest? How do they know? (greatest number)

Look at the remaining three numbers. Ask students how to compare the numbers that have the same amount of place value spaces.
Students should say that they look at the greatest place value space and compare those numbers.

- Say: I know that 3 is less than 6 and 9, so that number will be the least. Then, I know that 6 is less than 9, so that number comes next. The number with the 9 in the ten millions place is the greatest of the three, so that goes next. Finally, the number with 9 place value spaces is the greatest.

Tell students that because the last number is the greatest, that means that planet is farther away from the sun than the rest.

Ask students: What planets do you think these distances refer to? Refer back to the model of paper planets completed on Day 2.

Tell the students that they are going to work with the teacher to order the number of rocks found on four planets by NASA from least to greatest. Data is found in Explanation Section (Teacher-Student Data) on Teacher Resource 11. Ask the students what the first step should be in comparing the number of rocks.

- Students should say to look at the total number of place value spaces (all the same).
- Students should then say to look at the greatest place value space, the hundred thousands, and compare each of those numbers.
- Students should then say that 2 is less than 3, so the number of rocks on Jupiter and Saturn is less than those on Mars and Venus.

Demonstrate how to compare the numbers until you come to a place value that is different. Order the numbers from least to greatest.

Give pairs of students four new numbers and tell them that these numbers will be slightly larger, but they will use the same process to order them from least to greatest. Data will be money currently spent by NASA and is found in Explanation Section (Student Data) on Teacher Resource 11. Circulate and assist students where necessary.

Ask one pair of students to demonstrate how they ordered the data from least to greatest.

- Application
  Give pairs of students game cards for Orbital Ordering (Teacher Resource 12A) Circulate and assist where necessary.

- Differentiation
  - Reteach

    Students demonstrating difficulty will be pulled into a small group to work with you in a small group. Instruct students to use their foldable place value chart from Day 1 to help them with the following task.

    Give each student digit cards from 0-9 and one number cube
    Instruct students to generate a number by rolling their number cube until all place value spaces in the foldable are filled. Instruct students to stack foldables so they can use the place value labels to compare one digit at a time. Work with students until the foldable at the top of the stack is the lowest number and the foldable at the bottom of the stack is the highest number.

    Repeat the process until students display an understanding of comparing and ordering numbers.

  - Enrich

    Students who display proficiency in ordering numbers will work in pair to complete Between the Earth and the Sun (Student Resource 9). Answers can be found on Teacher Resource 13.

Summative Assessment:

Give students 20 minutes to complete the Space Value Assessment. This assessment will consist of 2 selected-response questions, a set of comparing numbers, and one brief-constructed response question. (Student Resource 10A-B. Answer key can be found on Teacher Resource 14A-B. The brief-constructed response question will be graded using a "Kid Friendly" rubric found on Teacher Resource 15.

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A Place in Space

Did you know the equatorial diameter of Jupiter is 88,734 miles? Use this number to answer the questions below.

88,734

1. What is the value of the 7 in the number above? _____
2. Circle the 8 in the thousands place.
3. Underline the 8 which has a value of 80,000.
4. Write the number in word form. _____

_____

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_____

Name _____ Date _____

Make a Number

Use your digit cards to help you complete this activity!

1. **Choose seven cards. Use 6 of the cards to form each number, then record your number on the spaces. Remember to place the comma(s) correctly!!**

   A number between 100,000 and 450,000

   _____ _____ _____ _____ _____ _____

   A number between 600,000 and 800,000

   _____ _____ _____ _____ _____ _____

2. **Choose eight cards. Use 7 of the cards to form each number.**

   A number between 3,300,000 and 7,100,000

   _____ _____ _____ _____ _____ _____ _____

   A number between 5,000,095 and 9,000,000

   _____ _____ _____ _____ _____ _____ _____

   A number between 1,000,000 and 3,500,000

   _____ _____ _____ _____ _____ _____ _____

3. **Use any of your digit cards. Use 8 of the cards to form each number.**

   A number between 23,000,000 and 43,000,000

   _____ _____ _____ _____ _____ _____ _____ _____

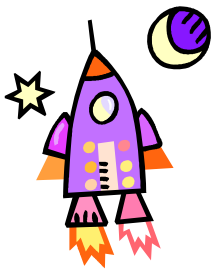
   A number between 55,000,200 and 80,000,000

   _____ _____ _____ _____ _____ _____ _____ _____

   A number between 10,000,000 and 32,000,000

   _____ _____ _____ _____ _____ _____ _____ _____

Roll a Number!



You are the part of a NASA team sent on a secret expedition to space. On your mission, you will be responsible for collecting and analyzing numbers. Follow the directions below to help you on your expedition.

Directions:

1. The older player is the Commander, and the younger player is the Crew Member.
2. The Commander rolls the number cube and decides where to place that digit. ("There is a 6 in the hundred thousands place" or "The value of the 6 is 60,000")
3. Both players record the digit on their Expedition Recording Sheet (remember to insert commas to separate the periods)
4. The Commander rolls again and play continues until all digits are named.
5. Players read and compare their numbers to make sure they have the same number.
6. Players answer questions about the number.
7. Players change rolls to create a new number.

Expedition 1

_____ Commander _____ Crew Member

_____ _____ _____ _____ _____ _____ _____ _____

Write a sentence about an object or measurement in space you think this number could represent.

_____

_____

Expedition 2

_____ Commander _____ Crew Member

_____ _____ _____ _____ _____ _____ _____ _____

Write a sentence about an object or measurement in space you think this number could represent.

_____

_____

Expedition 3

_____ Commander _____ Crew Member

_____ _____ _____ _____ _____ _____ _____ _____

Write a sentence about an object or measurement in space you think this number could represent.

_____

_____

Name _____ Date_____

Orbit Slip
Day 1

1. The planet Saturn has a diameter of 74,977 miles. The value of the **underlined digit** is_____.

2. Some of the records of space have been erased. We only know part of the diameter of Mars. Use the clues below to help find out the correct diameter of Mars.

△ , 2 □ 1

- Clue 1: The number that belongs in the triangle has a value of 4,000
- Clue 2: The number that belongs in the square has a value of 20.

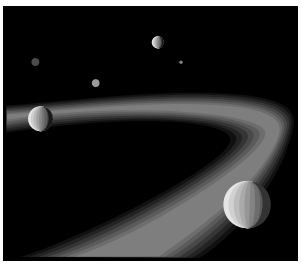
3. Write the following number in word form on the line below: 1,376,289

_____

Compare the Planets
Data Sheet

Which planet has the greatest distance from the sun? How did you know?

Which planet has the least distance from the sun? How did you know?



Explain how you compared the distances of the planets from the sun. Use important place value vocabulary!

Place Value Comparison Chart

Place Value Name	First Number	< , >, =	Second Number
Millions			
Hundred Thousands			
Ten Thousands			
Thousands			
Hundreds			
Tens			
Ones			

Greater Than, Less Than, Equal To

Directions: Below you will be given a series of numbers. For each number, write a number that is greater than, a number that is less than, and a number that is equal to your given number. At the bottom of the page, explain how you determined your answers.

Your Number	A Number Greater Than is…	A Number Less Than is…	A Number Equal to is…
17,875,976			
6,453			
348,765			

How did you determine your answers for the greater than, less than, and equal to columns? Be sure to use your place value vocabulary!

FINISHED EARLY? Challenge your partner by giving them a number and asking them to find a number that is greater than, less than, and equal to your number!

Name _____ Date _____

Orbit Slip
Day 2

Compare the numbers below using <, >, or =.

7,654,987 ◯ 7,653,211

8,675 ◯ 8,673

Explain how you compare two numbers. Use your place value vocabulary in your explanation!

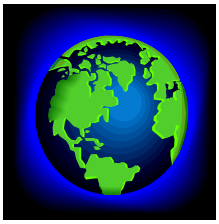
Name : _____ Date: _____

Between the Earth and the Sun

Directions: In each box below you will be given two numbers: a low number and a high number. It is your job to come up with **four** numbers that come in between those two numbers. Use your knowledge of comparing and ordering numbers!

Low Number				High Number
23,456				56,895
	_____	_____	_____ _____	

Low Number				High Number
1,345,965				1,345, 980
	_____	_____	_____ _____	



Low Number				High Number
2,746,545				2,747,233
	_____	_____	_____ _____	

Space Value Assessment

1. What is the value of the 6 in **36,204,157**?
   a. 6,000
   b. 60,000,000
   c. 6,000,000
   d. 600,000,000

2. Give the value of the underlined digit.
   1<u>2</u>5,905,672
   a. 200,000,000
   b. 20,000,000
   c. 2,000,000
   d. 2,000

3. Compare the number pairs using >, <, or =.

12,765,092 O 12,665,987

4,102,540 O 4,928,256

22,450,111 O 221,587,333

36,987,431 O 36,987,431

4. 

Brief Constructed Response

An asteroid is a large rock in outer space. The asteroid belt is divided into an inner belt, which consists of asteroids within 250,000,000 miles from the sun, and the outer belt, which consists of asteroids more than 250,000,000 from the sun.

Part A

Four asteroids are located at the following distances from the sun. Order them from those closest to the sun to those farthest from the sun (least to greatest). Use the distances in your answer.

Asteroids	Distance From the Sun
Asteroid 1	259,643,000 miles
Asteroid 2	182,076,000 miles
Asteroid 3	189,944,000 miles
Asteroid 4	251,432,000 miles

_____ < _____ < _____ < _____

Part B

Use what you know about ordering numbers to explain why your answer is correct. Use numbers, words, and/or symbols in your explanation.

_____

_____

_____

_____

_____

_____

A Place in Space

Did you know the equatorial diameter of Jupiter is 88,734 miles? Use this number to answer the questions below.

88,734

1. What is the value of the 7 in the number above? **700**
2. Circle the 8 in the thousands place.
3. Underline the 8 which has a value of 80,000.
4. Write the number in word form. **Eighty-eight thousand, seven hundred thirty-four**

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What's My Number?

- The number in the hundreds place is the product of 5 x 1.
- The number in the tens place is 4 less than the number in the hundreds place.
- The number in the ones place is the difference of 12 – 3.
- The number in the thousands place is 2 more than the number in the hundreds place.
- What is the number?

Answer: The number is 7,519.

Making a Foldable Place Value Chart

1. Divide an 11x17 inch piece of construction paper into 8 sections.
2. Fold the bottom edge of the paper up approximately 2" and crease. Glue or staple the outer edges of the paper to create a pocket.
3. Label each section from the ones place to the ten millions place.
4. Make digit cards (0 – 9) using index cards.
5. Digit cards may be placed into each section in order to represent a number.

Day 1 Number Clues

Explanation Problem for Teacher Modeling – Write on individual strips of paper and randomly hand out to students to read for the class model.

- The digit, 1, has a value of **1,000**
- The digit in the **hundreds** place is the product of 1x3
- The digit in the **ten thousands** place is the smallest even number
- The digit, 5, has a value of **500,000**
- The digit in the **ones** place is the sum of 6 + 2
- The digit in the **tens** place has a value of 90
- The digit in the **millions** place is a 7

Number – 7,501,398

Additional Problems for Teacher-Student Examples – Read aloud as students create the numbers on their place value foldables.

Class Problem #1

- There is a 7 in the ones place
- The hundreds place is the greatest single digit number
- The hundred thousands place is half of a dozen
- The digit, 4, has a value of 4,000,000
- The digit in the tens place is the difference of 9-4
- The digit, 2, has a value of 2,000
- The ten thousands place has no value

Number – 4,602,957

Class Problem #2

- There is a 7 in the **ten thousands** place
- The digit, 2, has a value of **2,000,000**
- The **hundreds** place has no value
- The digit, 6, has a value of **600,000**
- The digit in the **thousands** place is the product of 2x4
- The value of the tens place is **10**
- The digit, 4, has a value of **4**
- The number in the **ten millions** place is the difference between the ones place and the tens place

Number – 32,678,014

Class Problem #3
There is a 2 in the ten thousands place
The hundred thousands place is twice the ten thousands place
The digit, 8, has a value of 8,000
The digit, 1, has a value of 100
The digit in the millions place is the sum of the digits in the thousands and hundreds places
The digit in the ones place is 2 less than 8
The digit in the tens place is one more than the digit in the ones place
The digit, 3, has a value of 30,000,000

Number – 39,428,176

Class Problem #4
The hundred millions place is the product of 3x3
The tens place is one less than the hundred millions place
The digit, 6, has a value of 6
The millions place is the difference of 9 – 7
The digit 2, has a value of 2,000
The digit, 3, has a value of 30,000,000
The digit in the ten thousands place is the product of 1 x 7
The digit, 1, had a value of 100
The hundred thousands place is the product of 2 x 2

Number – 932, 472,186

Distances of Planets from the Sun
*(only write the **distances** on sentence strips)*

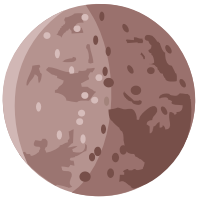
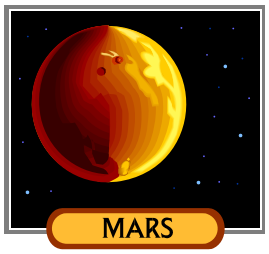
1. Mercury: 36,000,000 miles
2. Venus: 67,000,000 miles
3. Earth: 93,000,000 miles
4. Mars: 141,000,000 miles
5. Jupiter: 483,400,000 miles
6. Saturn: 886,700,000 miles

Other planets' distances that could be used for enrichment/extension

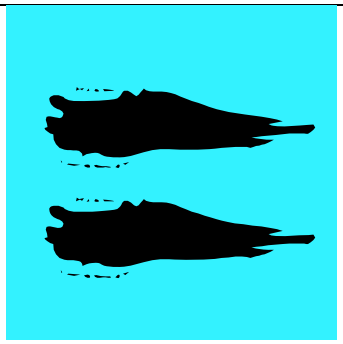
Uranus: 1, 783,000,000 miles

Neptune: 2, 794,000,000 miles

Compare the Planets!
Planet Cards

Mercury  38,000,000 miles from the sun	Venus  67,000,000 miles from the sun
Earth  93,000,000 miles from the sun	Mars  141,000,000 miles from the sun
Jupiter  484,400,000 miles from the sun	Saturn  886,700,000 miles from the sun
Uranus  1,783,000,000 miles from the sun	Neptune  2,794,000,000 miles from the sun

Compare the Planets
Game Pieces

		
Greater Than	Less Than	Equal To

Compare the Planets
Directions

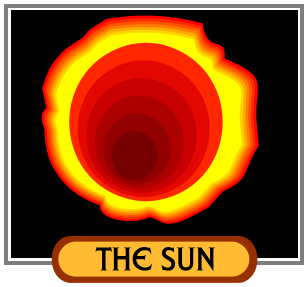
You have been sent on a mission by NASA to compare the distances of the planets from the sun. They have chosen you because of your knowledge of place value and numbers.

1. There will be two players in this game, Astronaut A and Astronaut B.
2. Your planet cards must be shuffled and placed face down in the center of your table.
3. Your greater than, less than, and equal to cards may be kept face up in the center of your table.
4. When you are ready to play, Astronaut A will draw a planet card and read the number aloud.
5. Astronaut B will then draw a planet card and read the number aloud.
6. Using your game piece symbols, compare the two planets' distances.
7. When finished with your first two cards, place them off to the side and repeat steps 4 and 5.
8. When you have used all of the planet cards, you may re-shuffle and play again.
9. Remember: NASA needs your data, so don't forget to complete the Compare the Planets worksheet when you have finished!

Compare the Planets
Data Sheet (Teacher Key)

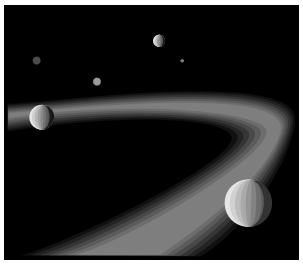
Which planet has the greatest distance from the sun? How did you know?

Saturn has the greatest distance from the sun because the number in the hundred millions place is larger than the number in Jupiter's hundred millions place.



Which planet has the least distance from the sun? How did you know?

Mercury has the least distance from the sun because it has less place value spaces than Saturn and Jupiter. Also, when I compared the ten millions place in Mercury to Venus's ten millions place, I saw that it was smaller.



Explain how you compared the distances of the planets from the sun. Use important place value vocabulary!

I first looked at the number of place value spaces for each planet. I knew that the planets with fewer place value spaces would be closer to the sun. For planets that had the same number of place value spaces, I started with the largest place value and compared the numbers to determine which was greater or less.

Place Value Comparison Chart

Place Value Name	First Number	< , >, =	Second Number
Millons			
Hundred Thousands			
Ten Thousands			
Thousands	7	=	7
Hundreds	6	=	6
Tens	5	>	4
Ones	4		3

7,654 > 7,643 because 5 tens is greater than 4 tens.

Greater Than, Less Than, Equal To

Directions: Below you will be given a series of numbers. For each number, write a number that is greater than, a number that is less than, and a number that is equal to your given number. At the bottom of the page, explain how you determined your answers.

Your Number	A Number Greater Than is…	A Number Less Than is…	A Number Equal to is…
17,875,976	*18,675,431*	*5,674*	*17,875,976*
6,453	*7,898,098*	*765*	*6.453*
348,765	*432,178*	*6,743*	*348,765*

How did you determine your answers for the greater than, less than, and equal to columns? Be sure to use your place value vocabulary!

I looked at the place values and to make a greater number, I must add more place value spaces or make the numbers in the largest place values greater. To make a lesser number, I must decrease the number of place value spaces or make the numbers in the largest place value smaller. A number equal to my number is the same because I know equal means the same.

FINISHED EARLY? Challenge your partner by giving them a number and asking them to find a number that is greater than, less than, and equal to your number!

Name _____ Date _____

Orbit Slip
Day 2 *(Answer Key)*

Compare the numbers below using <, >, or =.

7,654,987 > 7,653,211

8,675 > 8,673

Explain how you compare two numbers. Use your place value vocabulary in your explanation!

I first determine how many place value spaces there are. If there are more in the first number than the second, the first number is greater than the second. If the number of place value spaces is the same, then I start with the largest place value and compare the numbers one by one. Once I find a number that is greater, I know which number is larger.

Data for Day 3
Ordering Numbers

Exploration

- One rocket is traveling at 25,000 miles per hour, another rocket is traveling at 27,896 miles per hour, and the last rocket is traveling at 25,312 miles per hour.

Explanation

- Teacher Modeled Data
    - The distances are:
        - 141,000,000 miles
        - 67,000,000 miles
        - 36,000,000 miles
        - 93,000,000 miles
- Teacher-Student Data
        - Jupiter: 234,786 rocks
        - Saturn: 234, 752 rocks
        - Mars: 356,087 rocks
        - Venus: 306, 897 rocks
- Student Data
        - $69,000,000 to give the Hubble Space Telescope new equipment
        - $63,000,000 to buy new space suits for the astronauts
        - $110,000,00 to launch the shuttle to take space walking repairmen into space
        - $19,000,000 to add another Hubble mission to NASA's flight schedule

Orbital Ordering

Teacher - Cut cards and directions apart and put in baggies for each pair of students. Cards may be glued onto index cards to make larger cards.

Directions:

1. Take cards out of the baggies and stack in a pile face down.
2. Each person draws two cards and reads the numbers silently.
3. Work with your partner to order the four numbers from least to greatest.
4. Repeat the steps above until there are no cards remaining.
5. Shuffle the cards and begin again with different number combinations.

 **672,301,877**	 **899,555**	 **5,607,982**
 **90,721,389**	 **75,666,843**	 **301,817,963**

 **1,333,456**	 **7,235,080**	 **2,005,728**
 **45,987,123**	 **10,265,983**	 **66,303,215**
 **2,605,734**	 **7,239,444**	 **2,050,884**
 **999,333**	 **6,788,043**	 **4,765,990**
 **45,975,201**	 **10,263,404**	 **66,255,789**
 **5,387,011**	 **321,876,045**	 **111,704,672**

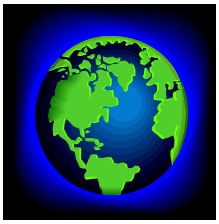
Name : _____ Date: _____

Between the Earth and the Sun

Directions: In each box below you will be given two numbers: a low number and a high number. It is your job to come up with four numbers that come in between those two numbers. Use your knowledge of comparing and ordering numbers to help! Possible Answers:

Low Number					High Number
23,456	*24,555*	*26,876*	*34,987*	*54,388*	56,895

Low Number					High Number
1,345,965	*1,345,966*	*1,345,970*	*1,345,975*	*1,345,979*	1,345, 980



Low Number					High Number
2,746,545	*2,746,677*	*2,746,700*	*2,747,000*	*2,747,231*	2,747,233

Space Value Assessment

4. What is the value of the 6 in **36,204,157**?
   a. 6,000
   b. 60,000,000
   c. *6,000,000*
   d. 600,000,000

5. Give the value of the underlined digit.

   1<u>2</u>5,905,672

   a. 200,000,000
   b. *20,000,000*
   c. 2,000,000
   d. 2,000

6. Compare the number pairs using >, <, or =.

12,765,092 > 12,665,987

4,102,540 < 4,928,256

22,450,111 < 221,587,333

36,987,431 = 36,987,431

4. 

Brief Constructed Response

An asteroid is a large rock in outer space. The asteroid belt is divided into an inner belt, which consists of asteroids within 250,000,000 miles from the sun, and the outer belt, which consists of asteroids more than 250,000,000 from the sun.

Part A

Four asteroids are located at the following distances from the sun. Order them from those closest to the sun to those farthest from the sun (least to greatest). Use the distances in your answer.

Asteroids	Distance From the Sun
Asteroid 1	259,643,000 miles
Asteroid 2	182,076,000 miles
Asteroid 3	189,944,000 miles
Asteroid 4	251,432,000 miles

182,076,000 < 189,944,000 < 251,432,000 < 259,643,000

Part B

Use what you know about ordering numbers to explain why your answer is correct. Use numbers, words, and/or symbols in your explanation.

All four numbers have nine digits so I knew I had to compare the numbers beginning with the hundred millions place. 1 is less than 2 so I started with the numbers with a 1 in the hundred millions place. Two numbers had a 1 in the hundred millions place, and an 8 in the ten millions place, so I had to look in the millions place. 2 is less than 9 so 182,076,000 < 189,944,000. Two numbers had a 2 in the hundred millions place and a 5 in the ten millions place so I had to look at the millions place again. 1 is less than 9 so 251,432,000 < 259,643,000. So, 182,076,000 < 189,944,000 < 251,432,000 <259,643,000.

MSA Brief Constructed Response "Kid Speak" Mathematics Rubric
Grades 1 through 8

Score	
2	My answer shows I completely understood the problem and how to solve it: • I used a very good, complete strategy to correctly solve the problem. • I used my best math vocabulary to clearly explain what I did to solve the problem. My explanation was complete, well-organized and logical. • I applied what I know about math to correctly solve the problem. • I used numbers, words, symbols or pictures (or a combination of them) to show how I solved the problem.
1	My answer shows I understood most of the problem and how to solve it: • I used a strategy to find a solution that was partly correct. • I used some math vocabulary and most of my reasons were correct to explain how I solved the problem. My explanation needed to be more complete, well-organized or logical. • I partly applied what I know about math to solve the problem. • I tried to use numbers, words, symbols or pictures (or a combination of them) to show how I got my answer, but these may not have been completely correct.
0	My answer shows I didn't understand the problem and how to solve it: • I wasn't able to use a good strategy to solve the problem. • My strategy wasn't related to what was asked. • I didn't apply what I know about math to solve the problem. • I left the answer blank.